# Getting Started with Your AT-GPIB/TNT (PnP) and the NI-488.2™ Software for DOS

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## Federal Communications Commission

This device complies with Part 15 of the Federal Communications Commission (FCC) Rules for a Class B digital device. A Class B device is distinguishable from a Class A device by the appearance of an FCC ID number located on the Class B device.

## Canadian Department of Communications

This device complies with the limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications (DOC).

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe B prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des communications du Canada.

## Instructions to Users

These regulations are designed to provide reasonable protection against interference from the equipment to radio and television reception in residential areas.

There is no guarantee that interference will not occur in a particular installation. However, the chances of interference are much less if the equipment is installed and used according to this instruction manual.

If the equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, one or more of the following suggestions may reduce or eliminate the problem.

- Operate the equipment and the receiver on different branches of your AC electrical system.
- Move the equipment away from the receiver with which it is interfering.
- Reorient or relocate the receiver's antenna.
- Be sure that the equipment is plugged into a grounded outlet and that the grounding has not been defeated with a cheater plug.

**Notice to user:** Changes or modifications not expressly approved by National Instruments could void the user's authority to operate the equipment under the FCC Rules.

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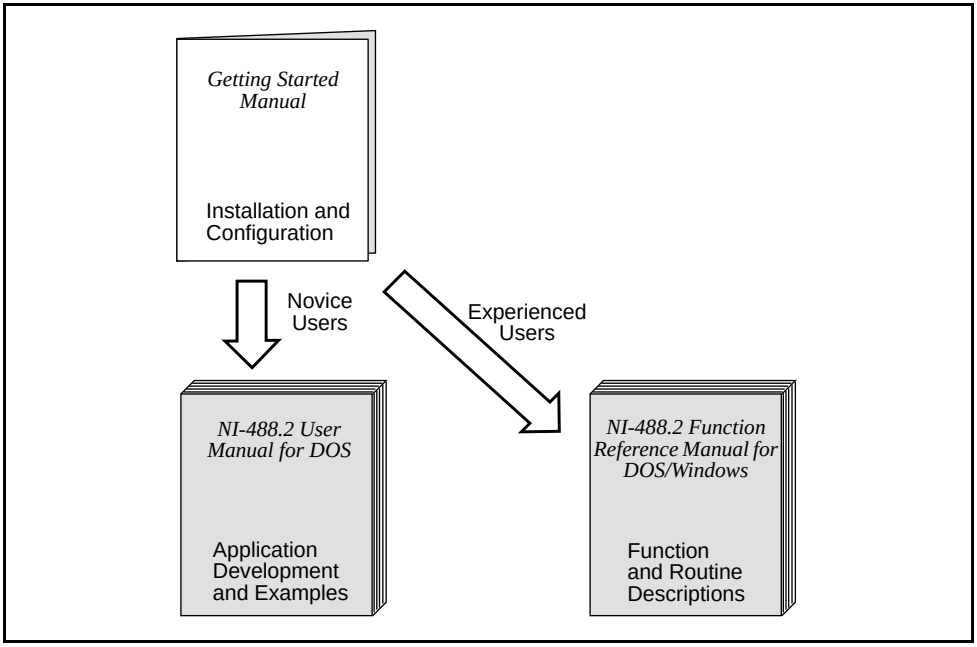
# About This Manual

This manual contains instructions to help you install and configure the National Instruments AT-GPIB/TNT (PnP) interface board, and the NI-488.2 software for DOS. The NI-488.2 software is intended for use with MS-DOS version 4.0 or higher (or equivalent). This manual assumes that you are already familiar with DOS.

## How to Use the Manual Set




Use this getting started manual to install and configure your AT-GPIB/TNT (PnP) board and the NI-488.2 software for DOS.

Use the *NI-488.2 User Manual for DOS* to learn the basics of GPIB and how to develop an application program. The user manual also contains debugging information and detailed examples.

Use the *NI-488.2 Function Reference Manual for DOS/Windows* for specific NI-488 function and NI-488.2 routine information, such as format, parameters, and possible errors.

## Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, explains how to use this manual, lists what you need to get started, and briefly describes the AT-GPIB/TNT (PnP) board and the NI-488.2 software.
- Chapter 2, *Installation and Configuration*, contains instructions to help you install and configure your NI-488.2 software and AT-GPIB/TNT (PnP).
- Chapter 3, *Verify the Installation*, describes how to verify the hardware and software installation.
- Chapter 4, *Begin to Use the AT-GPIB/TNT (PnP)*, describes the `ibic` utility and lists some programming considerations.
- Appendix A, *Specifications*, describes the physical characteristics of the AT-GPIB/TNT (PnP) hardware and software, along with the recommended operating conditions.
- Appendix B, *Troubleshooting*, describes how to troubleshoot problems.
- Appendix C, *Common Questions*, lists common questions and answers.
- Appendix D, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.
- The *Glossary* contains an alphabetical list and a description of terms used in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.

## Conventions Used in This Manual

The following conventions are used in this manual.

| | |
|---|---|
| *italic* | Italic text denotes emphasis, a cross reference, or an introduction to a key concept. |
| ***bold italic*** | Bold italic text denotes a note, caution, or warning. |
| `monospace` | Text in this font denotes text or characters that are to be literally input from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, directories, programs, subprograms, subroutines, device names, functions, variables, field names and filenames. |

| | |
|---|---|
| **`bold monospace`** | Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. |
| IEEE 488 and IEEE 488.2 | IEEE 488 and IEEE 488.2 refer to the ANSI/IEEE Standard 488.1-1987 and the ANSI/IEEE Standard 488.2-1992, respectively, which define the GPIB. |
| AT-GPIB/TNT (PnP) | AT-GPIB/TNT (Plug and Play) interface board. |

Abbreviations, acronyms, metric prefixes, mnemonics, symbols, and terms are listed in the *Glossary*.

## Related Documentation

The following documents contain information that you may find helpful as you read this manual.

- ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*
- ANSI/IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols, and Common Commands*
- *Microsoft MS-DOS User's Guide*, Microsoft Corporation

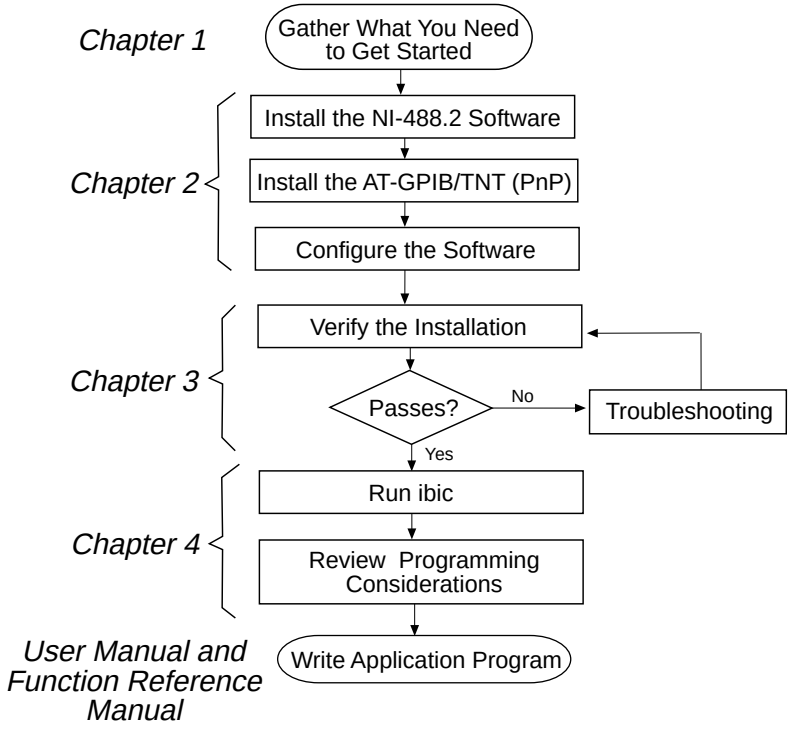
## Customer Communication

National Instruments wants to receive your comments on our products and manuals. We are interested in the applications you develop with our products, and we want to help if you have problems with them. To make it easy for you to contact us, this manual contains comment and configuration forms for you to complete. These forms are in Appendix D, *Customer Communication*, at the end of this manual.

# Chapter 1
# Introduction

This chapter explains how to use this manual, lists what you need to get started, and briefly describes the AT-GPIB/TNT (PnP) board and the NI-488.2 software.

## How to Use This Manual



## What You Need to Get Started

Make sure you have all of the items listed before you attempt to install the AT-GPIB/TNT (PnP) hardware and software.

- ☐ AT-GPIB/TNT (PnP) board, which comes with your kit
- ☐ 3.5 in. high density (1.44 MB) *NI-488.2 Software for DOS. Distribution Disk for the AT-GPIB/TNT+, AT-GPIB/TNT (Plug and Play), EISA-GPIB, AT-GPIB/TNT, and AT-GPIB*, which comes with your kit
- ☐ MS-DOS version 4.0 or higher (or equivalent) installed on your computer
- ☐ GPIB cables—single-shielded or double-shielded, Type X1, X2, X4, X5, or X11, which you can order from National Instruments

## Optional Equipment

Call National Instruments for more information about the following optional equipment.

- Serial or parallel bus extender and cables
- Bus expander/isolator
- GPIB mechanical switch
- GPIB data buffer

## AT-GPIB/TNT (PnP) Hardware Overview

The AT-GPIB/TNT (PnP) board transforms any PC AT compatible computer into a full-functioning GPIB Talker/Listener/Controller. The AT-GPIB/TNT (PnP) is completely software-configurable and is compliant with the Plug and Play ISA standard. In non Plug and Play systems, the AT-GPIB/TNT (PnP) can be fully configured through the NI-488.2 software. In Plug and Play systems, the board is fully configured on power-up. The TNT4882C chip on the board combines the circuitry of the NAT4882 ASIC, the Turbo488 ASIC, and GPIB transceivers to create a single-chip IEEE 488.2 interface. The TNT4882C also implements the HS488 high-speed protocol, which increases the maximum data transfer rate of the AT-GPIB/TNT (PnP) up to 3.4 Mbytes/s, when used in an EISA computer. For more information about HS488, refer to Chapter 7, *GPIB Programming Techniques*, in the *NI-488.2 User Manual for DOS.*

You can use standard GPIB cables to connect the AT-GPIB/TNT (PnP) with up to 14 instruments. If you want to use more than 14 instruments, you can order a bus extender or expander from National Instruments. Refer to Appendix A, *Specifications*, for more information about the AT-GPIB/TNT (PnP) board specifications and recommended operating conditions.

## NI-488.2 Software Overview

The NI-488.2 software, along with the AT-GPIB/TNT (PnP) hardware, transforms a general-purpose PC into a GPIB Talker/Listener/Controller with complete communications and bus management capability. The NI-488.2 software includes the following components:

- Device driver
- Language interface libraries for the following languages:
  - BASICA
  - GWBASIC
  - Microsoft QuickBASIC
  - Microsoft Professional BASIC
  - Microsoft Visual Basic for DOS
  - Microsoft C
- Configuration utilities
- Hardware and software diagnostic tests
- Interactive control program
- Utilities for software development
- Example programs that use NI-488 functions and NI-488.2 routines

Refer to Appendix A, *Specifications*, for more information about the NI-488.2 software specifications and recommended operating conditions.

## Plug and Play Overview

The term *Plug and Play* refers to a new industry standard designed to help you add peripheral boards in a personal computer system. With Plug and Play you can configure a new add-on board entirely from software, without moving jumpers or changing DIP switches on the board.

A Plug and Play ready system is one in which cooperation takes place between the hardware, the operating system, device drivers, and applications. Most add-on boards need system resources (DMA channels, interrupts, I/O space) in order to interact with

software such as device drivers. Centralized resource management is needed to arbitrate the assignment of system resources such as interrupt levels (IRQ) and DMA channels. For example, if a given PnP ISA board is configured to use DMA channel 5, the centralized resource manager should prevent the assignment of DMA channel 5 to any other card. This support is not provided by DOS. However, a Plug and Play ready system can be achieved under DOS with the Intel Plug and Play Kit for MS-DOS and Windows, which may come pre-installed on some machines.

For systems that are not Plug and Play ready, National Instruments provides a jumperless configuration. Specific resources must be chosen for the board using a configuration utility, but you are not required to power down the system and change physical jumper settings on the board.

For maximum flexibility, National Instruments provides the `ni-pnp` utility, which checks the configuration of your National Instruments Plug and Play boards, regardless of which type of system you have (jumperless or Plug and Play ready).

## ni-pnp Utility Overview

The `ni-pnp` utility is a small program which runs each time your computer is rebooted. It collects information about all of the National Instruments Plug and Play boards in your system. It then creates a list of these interfaces, which is used by the NI-488.2 driver and configuration utility, `ibconf`. In systems that are Plug and Play ready, `ni-pnp` simply retrieves the current configuration of each interface. In systems without Plug and Play system software, `ni-pnp` performs the actual configuration of each interface. It relies on the resource settings made with `ibconf` to assign resources to the boards. After the configuration of each board is determined, `ni-pnp` provides this information to the NI-488.2 driver. `ni-pnp` relieves the driver from the job of finding and configuring Plug and Play boards.

## Optional Programming Tools

Your kit includes the NI-488.2 software for DOS. In addition, you can order the LabWindows® software from National Instruments. LabWindows includes instrument driver libraries that make it easier to communicate with your GPIB instruments.

LabWindows is an interactive C/QuickBASIC development environment for building test and measurement and instrument control systems. It includes interactive code-generation tools and a graphical editor for building custom user interfaces. It also includes built-in libraries for IEEE 488.2, VXI, RS-232 control, and plug-in data acquisition. When you order LabWindows, you also get more than 300 complete instrument drivers, which are modular, source-code programs that handle the communication with your instrument so that you do not have to learn the programming details.

For more information about LabWindows, contact National Instruments.

# Chapter 2
# Installation and Configuration

This chapter contains instructions to help you install and configure your NI-488.2 software and AT-GPIB/TNT (PnP).

## Install Your NI-488.2 Software

Complete the following steps to run the software installation program.

1. Insert the NI-488.2 software for DOS distribution disk into an unused drive.
2. Begin the software installation by entering the following command:

   `x:\install`

   where *x* is the letter of the drive containing the distribution disk (usually `a` or `b`).

The software installation begins with the screen shown in Figure 2-1.

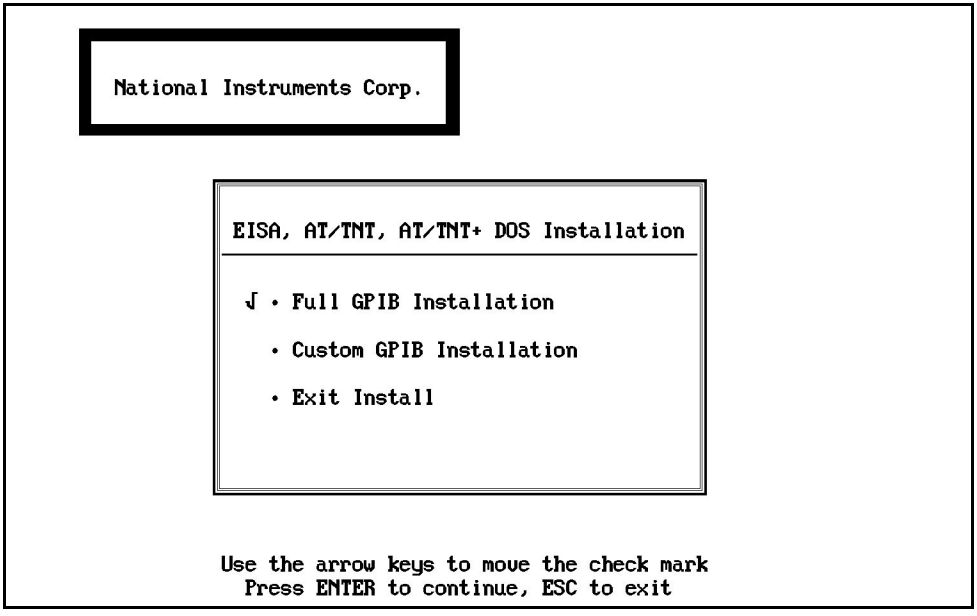

National Instruments Corp.
EISA, AT/TNT, AT/TNT+ DOS Installation
√ • Full GPIB Installation
• Custom GPIB Installation
• Exit Install
Use the arrow keys to move the check mark
Press ENTER to continue, ESC to exit

Figure 2-1. NI-488.2 Software Installation Screen

3. Select the type of installation you want.

   - Selecting `Full GPIB Installation` installs all NI-488.2 software files on your hard drive.

   - Selecting `Custom GPIB Installation` lets you select the parts of the NI-488.2 software to install on your hard drive.

   You can use the escape key <ESC> at any time to abort the installation.

4. After the installation is complete, reboot your computer.

   To load the NI-488.2 driver for DOS, you must reboot your computer. If the installation is successful, the driver displays a banner message on your screen when DOS loads the driver.

5. After you have installed your software, you might need to modify the configuration of the driver. If you are not using any Plug and Play system software, you *must* run `ibconf`. Skip to the section *Configure Your NI-488.2 Software*. If your system is Plug and Play ready, proceed to the next section *Install the AT-GPIB/TNT (PnP) Hardware*.

## Install the AT-GPIB/TNT (PnP) Hardware

**Warning:** ***Several components on your AT-GPIB/TNT (PnP) board can be damaged by electrostatic discharge. To avoid such damage in handling the board, touch the antistatic plastic package to a metal part of your computer chassis before removing the board from the package.***

Perform the following steps to install the AT-GPIB/TNT (PnP) board:

1. Turn off your computer. Keep the computer plugged in so that it remains grounded while you install the AT-GPIB/TNT (PnP) board.

2. Remove the top cover (or other access panels) to give yourself access to the computer expansion slots.

3. Find an unused 16-bit ISA expansion slot in your computer.

4. Remove the corresponding slot cover on the back panel of the computer.

5. Insert the AT-GPIB/TNT (PnP) board into the slot with the GPIB connector sticking out of the opening on the back panel, as shown in Figure 2-2. It might be a tight fit, but do not force the board into place.

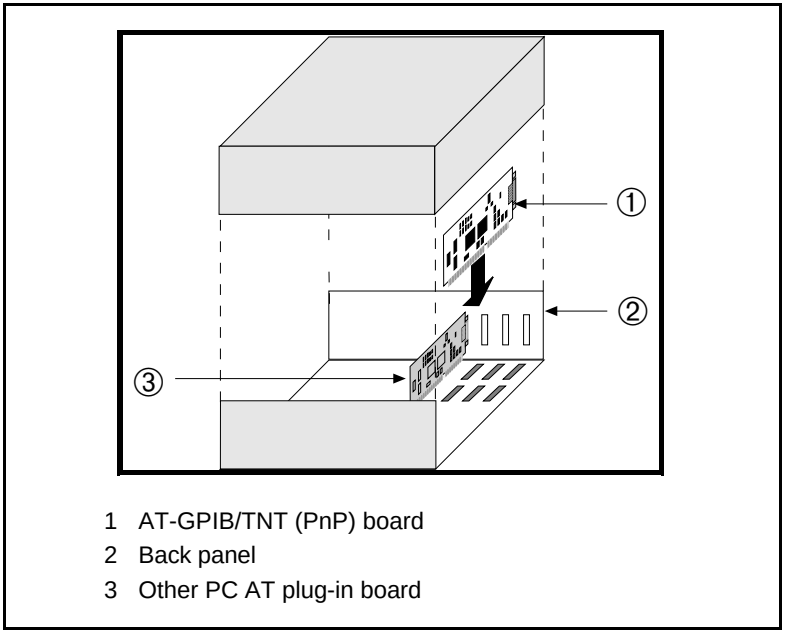



Figure 2-2. Installing the AT-GPIB/TNT (PnP) Board

6. Screw the mounting bracket of the AT-GPIB/TNT (PnP) board to the back panel rail of the computer.

7. Check the installation.

8. Replace the top cover or access port to the I/O channel.

9. Turn on your computer.

## Configure Your NI-488.2 Software

`ibconf` is an interactive utility you can use to examine or modify the configuration of the driver.

If your system is Plug and Play ready, you do not need to run `ibconf` unless you are using more than one AT-GPIB/TNT (PnP) board in your system. If you are using more than one board, you can use `ibconf` to associate each logical board, GPIBn, with a particular board, as identified by its serial number.

If you are using a jumperless system, you must run `ibconf` to assign resources for each AT-GPIB/TNT (PnP) board in the system.

To run `ibconf`, go to the directory where the NI-488.2 software is installed, and enter the following command:

```
ibconf
```

After you enter `ibconf`, use the cursor keys and online help information to examine the settings and make any necessary changes. To exit `ibconf`, press <Esc> or the function key <F9> and save your changes. For more information about `ibconf`, refer to the *NI-488.2 User Manual for DOS.*

If you plan to use the HS488 high-speed protocol, you must specify in `ibconf` the total length of GPIB cable in your system.

# Chapter 3
# Verify the Installation

This chapter describes how to verify the hardware and software installation.

## Run the Hardware Diagnostic Test

To verify and test the hardware installation, run the `ibdiag` hardware diagnostic program that came with your NI-488.2 software. `ibdiag` verifies that your hardware is functioning properly and that the configuration of your board does not conflict with anything else in your system.

Follow these steps to run `ibdiag`:

1. Disconnect any GPIB cables.
2. Go to the directory where the software is installed (for example, `c:\at-gpib`).
3. Enter the following command:

   ```
   ibdiag
   ```

If `ibdiag` completes with no errors, your hardware is functioning properly. If `ibdiag` returns an error message, refer to Appendix B, *Troubleshooting*, for troubleshooting instructions. When ibdiag completes with no errors, continue with the next section to run the software diagnostic test.

## Run the Software Diagnostic Test

After you have run `ibdiag`, verify and test the NI-488.2 software installation by running the `ibtest` software diagnostic program that came with your NI-488.2 software. The `ibtest` program is an NI-488.2 application that makes calls to the driver just as your application does.

Follow these steps to run `ibtest`:

1. Disconnect any GPIB cables.
2. Go to the directory where the software is installed (for example, `c:\at-gpib`).
3. Enter the following command:

   ```
   ibtest
   ```

If `ibtest` completes with no errors, you have installed the NI-488.2 software correctly. If `ibtest` returns an error message, refer to Appendix B, *Troubleshooting*, for troubleshooting instructions.

# Chapter 4
# Begin to Use the AT-GPIB/TNT (PnP)

This chapter describes the `ibic` utility and lists some programming considerations.

## Introduction to ibic

You can use `ibic`, the Interface Bus Interactive Control utility, to enter NI-488 functions and NI-488.2 routines interactively and to display the results of the function calls automatically. Without writing an application, you can use `ibic` to do the following:

- Verify GPIB communication with your device quickly and easily.
- Learn the NI-488 functions and NI-488.2 routines before you write your application.
- Become familiar with the commands of your device.
- Receive data from your GPIB device.
- Troubleshoot problems with your application.

For more information about `ibic`, refer to the *NI-488.2 User Manual for DOS.*

## General Programming Considerations

As you begin developing your NI-488.2 application, remember the following points:

- You must link the language interface library with your compiled source code.
- You must include the header file in your source code.

For information about choosing a programming method, developing your application, or compiling and linking, refer to the *NI-488.2 User Manual for DOS.* For detailed information about each NI-488 function and NI-488.2 routine, refer to the *NI-488.2 Function Reference Manual for DOS/Windows*.

# Appendix A
# Specifications

This appendix describes the physical characteristics of the AT-GPIB/TNT (PnP) hardware and software, along with the recommended operating conditions.

## Hardware

Table A-1. AT-GPIB/TNT (PnP) Hardware Characteristics

| Characteristic | Specification |
|---|---|
| Dimensions | 10.67cm. by 16.51 cm.<br>(4.2 in. by 6.5 in.) |
| Power Requirement<br>(from PC AT I/O channel) | +5 VDC 120 mA Typical<br>200 mA Maximum |
| I/O Connector | IEEE 488 Standard 24-pin |
| Operating Environment<br>Component Temperature<br>Relative Humidity | <br>0° to 40° C<br>10% to 90%, noncondensing |
| Storage Environment<br>Temperature<br>Relative Humidity | <br>-20° to 70° C<br>5% to 90%, noncondensing |
| EMI | FCC Class B Certified |

## Software

Table A-2. NI-488.2 Software Characteristics for the AT-GPIB/TNT (PnP)

| Characteristic | Specification |
|---|---|
| Maximum GPIB Transfer Rates | |
| 3-wire (IEEE 488) | 1.5 Mbytes/s* |
| High Speed (HS488) | |
| In ISA computer | 1.6 Mbytes/s* |
| In EISA computer | 3.4 Mbytes/s* |
| * Actual speed may vary considerably from speed shown due to system and instrumentation capabilities. | |

# Appendix B
# Troubleshooting

This appendix describes how to troubleshoot problems.

## Troubleshooting ni-pnp Error Messages

The `ni-pnp.exe` program should be located in the root directory of your boot drive, usually `C:\`. It should be run from your `autoexec.bat` file, so that `ni-pnp` executes every time your system is started. `ni-pnp` normally produces very little output when it is run, displaying only the name of each National Instruments interface board it detects. Most errors that `ni-pnp` might detect are handled transparently. If `ni-pnp` finds an error from which it cannot recover, it displays a message and describes the best method for fixing the problem.

Some possible problems that `ni-pnp` might report include boards with unassigned resources and boards for which resource conflicts exist. If `ni-pnp` encounters a board with no assigned resources, it displays the following message:

**`This interface has no assigned resources.`**

If you get this message, you must run `ibconf` and assign resources to the board. If `ni-pnp` detects an I/O address conflict, it displays the following message:

**`I/O Address Conflict.`**

If you get this message, you must run `ibconf` and change the base I/O address for the board.

You can run `ni-pnp` in a verbose output mode. In this mode, `ni-pnp` displays more information about each interface, including its assigned resources. To run `ni-pnp` in verbose mode, change to the directory which contains `ni-pnp.exe`. This is the root of the boot drive (usually `C:\`). Run `ni-pnp` with the verbose output flag by typing `ni-pnp /v`.

Another, more serious error can also occur on systems that are not Plug and Play ready. Since `ni-pnp` must assign resources to the boards, it must first perform the Plug and Play ISA isolation sequence. The isolation sequence is a method by which all Plug and Play boards can be detected. It is possible, although rare, that this isolation sequence could lock up your computer. If this occurs, restart your computer. `ni-pnp` will then detect that your computer was locked up and display an error message describing the problem. `ni-pnp` can enter a fail-safe detection mode where it records each I/O port before testing that port. If your computer locks up while testing a port in this mode, `ni-pnp` will exclude that I/O port from future testing. If you know that you do not have any National Instruments Plug and Play boards in your system, you can configure

`ni-pnp` so that it does not attempt to detect any Plug and Play boards. `ni-pnp` will prompt you to choose between entering the fail-safe mode or disabling the detection of Plug and Play boards.

# Troubleshooting ibdiag Error Messages

## Resource Conflicts

In this section the term *resource* refers to an ISA interrupt level, a DMA channel, or an I/O address range. A resource conflict occurs if the AT-GPIB/TNT (PnP) is assigned a resource that is being used by some other device in the system. Most `ibdiag` errors are due to resource conflicts. Your system will not work properly if a resource conflict exists, so you should resolve all conflicts before using your AT-GPIB/TNT (PnP).

## Interrupt Conflicts

You may configure the AT-GPIB/TNT (PnP) to use one ISA interrupt level. An interrupt conflict occurs if another plug-in board (or a device on the computer motherboard) is configured to use the same ISA interrupt level. To resolve an interrupt conflict, you must do one of the following:

- Change the interrupt level used by the AT-GPIB/TNT (PnP).
- Change the interrupt level used by the other plug-in board.
- Configure the AT-GPIB/TNT (PnP) not to use interrupts.

Refer to the section in this appendix entitled *Steps to Troubleshoot ibdiag Error Messages*.

## DMA Conflicts

You may configure the AT-GPIB/TNT (PnP) to use one ISA DMA channel. A DMA conflict occurs if another plug-in board (or a device on the computer motherboard) is configured to use the same DMA channel. To resolve a DMA conflict, you must do one of the following:

- Change the DMA channel used by the AT-GPIB/TNT (PnP).
- Change the DMA channel used by the other plug-in board.
- Configure the AT-GPIB/TNT (PnP) not to use DMA transfers.

Refer to the section in this appendix entitled *Steps to Troubleshoot ibdiag Error Messages*.

## I/O Address Range Conflicts

The AT-GPIB/TNT (PnP) uses 32 contiguous I/O addresses. The lowest address used by the AT-GPIB/TNT (PnP) is the *base address*. For example, if the base address of the AT-GPIB/TNT (PnP) is 2C0 (hex), the AT-GPIB/TNT (PnP) uses all 32 addresses in the range 2C0 through 2DF (hex). An I/O address range conflict exists if another plug-in board (or a device on the computer motherboard) is configured to use any address in the I/O address range used by the AT-GPIB/TNT (PnP). To resolve a I/O range conflict do one of the following things:

- Change the base address used by the AT-GPIB/TNT.
- Change the I/O range used by the other plug-in board.

## Steps to Troubleshoot ibdiag Error Messages

1. Check if any GPIB cables are connected to your board. If any GPIB cables are connected to your GPIB board, disconnect the cables and run `ibdiag` again.
2. Note which error message `ibdiag` displays. The most common error messages are as follows:

   **`<<< Base I/O Address Conflict >>>`**

   **`<<< Interrupt Level Conflict >>>`**

   **`<<< DMA Channel Conflict >>>`**

   **`<<< Error Reading NI-PNP.INI >>>`**

   If the error occurs in reading `ni-pnp.ini`, try reinstalling the software and then run `ibdiag` again. If a resource conflict exists, write down the exact resource tested. For example, if a DMA resource conflict exists, note which DMA channel (5, 6, or 7) was tested.
3. Run the `ni-pnp` utility in verbose mode to determine what software configures the Plug and Play circuitry of your AT-GPIB/TNT (PnP).
4. If `ni-pnp` reports **`Intel Configuration Manager Version x.xx Found`**, refer to the next section entitled *Resolving Conflicts with the Intel Configuration Utility*. Otherwise, continue with step 5.

5. Run the `ibconf` utility to change the resources used by your AT-GPIB/TNT (PnP). If `ibdiag` indicated that your AT-GPIB/TNT (PnP) failed because of a base I/O address conflict, change the base I/O address location of your AT-GPIB/TNT (PnP) in `ibconf`. Similarly, if `ibdiag` indicated an interrupt level conflict or DMA channel conflict, change the appropriate setting in `ibconf`. For more information about `ibconf`, refer to Chapter 2, *Installation and Configuration.*
6. Save the new `ibconf` settings.
7. Reboot the computer
8. Run `ibdiag` again and go back to step 1.

## Resolving Conflicts with the Intel Configuration Utility

If a resource conflict exists, the Intel software does not have the resource information for some legacy ISA board in your system. It is therefore free to assign to the AT-GPIB/TNT (PnP) some resource that is already used. To resolve the resource conflict, complete the following steps:

1. Run the ISA Configuration Utility (ICU).
2. Modify the configuration of the AT-GPIB/TNT (PnP). For example, if the `ibdiag` error message noted in step 2 above indicates an interrupt conflict on interrupt level 11, configure that AT-GPIB/TNT (PnP) to use another available interrupt level.
3. Try to determine which other plug-in board is using the conflicting resource. Consult the documentation that came with the other plug-in boards.
4. Depending on whether you can determine which other plug-in board is using the conflicting resource, complete the following steps:
    a. If you can determine which plug-in board is using the conflicting resource, add the board information to the ICU system configuration. After you add the board information, skip to step 5.
    b. If you cannot determine which plug-in board is using the conflicting resource, you need to add an *Unknown* board to the system configuration.
    c. When the dialog box asks if you have a configuration file for this unknown board, respond “No”.
    d. For Card Name, enter “Unknown”.
    e. Assign the conflicting resources to the board. For example, if the `ibdiag` error message noted in step 2 above indicates an interrupt conflict on interrupt level 11, assign interrupt level 11 to the “Unknown” board. Doing this prevents the ICU from assigning interrupt 11 to the AT-GPIB/TNT (PnP).

5. Save the changes and exit the ICU.

6. Reboot the computer and run `ibdiag` again.

If you still have problems after completing these steps, you may have other conflicts to resolve. Repeat these steps until you have resolved all of the conflicts.

# Troubleshooting ibtest Error Messages

The following sections explain common error messages generated by `ibtest`.

**Note:** ***In the following paragraphs,*** `gpib`*x* ***refers to board*** `gpib0`, `gpib1`, `gpib2`, ***or*** `gpib3` ***as appropriate.***

## Presence Test of Software Components

The `ibtest` program tests for the presence of the `ni-pnp.ini`. If `ni-pnp.ini` is not located in the root of the boot drive, `ibtest` displays the following error message:

```
An unexpected ERROR occurred:
   Unable to locate NI-PNP.INI in the root of drive c:.
   Try rebooting your computer or reinstalling the NI-488.2
   software.
```

If you get this error message, try rebooting your computer and running `ibtest` again. If you get the same message, you must reinstall the NI-488.2 software.

## Presence Test of Driver

The `ibtest` program tests for the presence of the NI-488.2 driver. `ibtest` displays the following message if it detects a problem:

```
<<<  No handler present for GPIBx.  >>>
```

If this message appears, make sure that the GPIB driver is installed. To make sure that the driver is being loaded, check that the following line is in your `config.sys` file:

`device =` *`drive`*`:\`*`path`*`\gpib.com`

where *`drive`* is the drive where the NI-488.2 software is installed (usually `c:`) and *`path`* is the directory path on the drive to the NI-488.2 software (for example, `at-gpib`).

## Presence Test of Board

The following error message appears if `gpib`*`x`* is not installed or if the software is not configured properly:

**<<< No board present for GPIB*x*. >>>**

If this message appears, you could have one of the following situations:

- The board might not be properly configured. Run `ibconf` to verify the hardware settings. Refer to *Configure Your NI-488.2 Software* in Chapter 2, *Installation and Configuration.*
- The board might not be properly installed. For detailed instructions refer to Chapter 2, *Installation and Configuration.*

## GPIB Cables Connected

The following error message appears if a GPIB cable is connected to the board when you run `ibtest`:

**Call(25) 'ibcmd " "' failed, ibsta (0x134) not what was expected (0x8130)**

**Call(25) 'ibcmd " "' failed, expected ibsta (0x100) to have the ERR bit set.**

Disconnect all GPIB cables before trying the test again.

## ULI Driver Loaded

If you try to use NI-488 functions or NI-488.2 routines or run `ibtest` with the ULI driver `uli.com` loaded, the following error message appears and your computer might lock up.

**Syntax Error**

While the ULI driver is loaded, you cannot use the standard NI-488 functions or NI-488.2 routines. Reboot your computer so that the ULI driver is not loaded. If your `autoexec.bat` file loads `uli.com`, change the line that loads `uli.com` to a comment before rebooting your computer.

# Appendix C
# Common Questions

This appendix lists common questions and answers.

**Which NI-488.2 software (DOS or Windows) do I need to install?**

If you want to run a GPIB application under DOS, install the NI-488.2 software for DOS. If you want to run a GPIB application in Windows, you must install the NI-488.2 software for Windows.

**Can I have the NI-488.2 software for DOS and Windows drivers installed at the same time?**

Yes, there is nothing wrong with installing both. However, it is better not to use them at the same time.

**How can I determine which type of GPIB board I have installed?**

Run the `GPIBInfo` utility. If you run `GPIBInfo` without specifying any parameters, it returns information about the GPIB boards currently configured for use in your system. If you know the base I/O address of a GPIB interface board, you can enter it as a parameter for specific information. For example, `GPIBInfo 2C0` returns information about the GPIB board at base I/O address 2C0. For more information about `GPIBInfo`, refer to the *NI-488.2 User Manual for DOS.*

**How can I determine which version of the NI-488.2 software I have installed?**

Run the `GPIBInfo` utility. If you run `GPIBInfo` without specifying any parameters, it returns information about the version of the NI-488.2 software currently installed. For more information about `GPIBInfo`, refer to the *NI-488.2 User Manual for DOS.*

**How can I determine if the Intel Plug and Play software is installed on my computer?**

Run the `ni-pnp` utility in verbose mode by passing a `/v` flag when you run it. If the Intel Configuration Manager is installed, `ni-pnp` prints out the message **`Intel Configuration Manager Version x.xx Found`**.

**Will `ni-pnp` work on a system that comes with the Intel Plug and Play software pre-installed?**

Yes, `ni-pnp` is designed to configure National Instruments Plug and Play boards if the Intel software is not installed and to check the configuration of boards if the Intel software is installed.

**What do I do if `ibdiag` or `ibtest` fails with an error?**

Refer to the troubleshooting sections of Appendix B, *Troubleshooting*, for specific information about what might cause these tests to fail.

**When should I use `ibic`?**

You can use `ibic` to test and verify instrument communication, troubleshoot problems, and develop your application program. For more information about `ibic`, refer to Chapter 5, *ibic–Interface Bus Interactive Control Utility*, in the *NI-488.2 User Manual for DOS*.

**How do I use an NI-488.2 language interface?**

For information about using NI-488.2 language interfaces, refer to Chapter 3, *Developing Your Application*, in the *NI-488.2 User Manual for DOS.*

**What information should I have before I call National Instruments?**

When you call National Instruments, you should have the results of the diagnostic tests `ibdiag` and `ibtest` and the output from `GPIBInfo` and `ni-pnp /v`. Also, make sure you have filled out the configuration form in Appendix D, *Customer Communication*.

# Appendix D
# Customer Communication

For your convenience, this appendix contains forms to help you gather the information necessary to help us solve technical problems you might have as well as a form you can use to comment on the product documentation. Filling out a copy of the *Technical Support Form* before contacting National Instruments helps us help you better and faster.

National Instruments provides comprehensive technical assistance around the world. In the U.S. and Canada, applications engineers are available Monday through Friday from 8:00 a.m. to 6:00 p.m. (central time). In other countries, contact the nearest branch office. You may fax questions to us at any time.

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| Denmark | 45 76 26 00 | 45 76 71 11 |
| Finland | (90) 527 2321 | (90) 502 2930 |
| France | (1) 48 14 24 24 | (1) 48 14 24 14 |
| Germany | 089/741 31 30 | 089/714 60 35 |
| Hong Kong | 2637 5019 | 2686 8505 |
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| Korea | 596-7456 | 596-7455 |
| Mexico | 202 2544 | 202 2544 |
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| Norway | 32-848400 | 32-848600 |
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| Spain | (1) 640 0085 | (1) 640 0533 |
| Sweden | 08-730 49 70 | 08-730 43 70 |
| Switzerland | 056/20 51 51 | 056/20 51 55 |
| Taiwan | 62 377 1200 | 62 737 4644 |
| U.K. | 1635 523545 | 1635 523154 |

# Technical Support Form

Technical support is available at any time by fax. Include the information from your configuration form. Use additional pages if necessary.

Name _____

Company _____

Address _____

_____

Fax ( ___ )_____ Phone ( ___ )_____

Computer brand _____

Model _____ Processor _____

Operating system _____

Speed _____MHz RAM _____MB

Display adapter _____

Mouse _____yes _____no

Other adapters installed _____

Hard disk capacity _____MB Brand _____

Instruments used _____

National Instruments hardware product model _____

Revision _____

Configuration _____

National Instruments software product _____

Version _____

Configuration _____

(continues)

The problem is

List any error messages

The following steps will reproduce the problem

# GPIB Board Hardware and Software Configuration Form

Record the settings and revisions of your hardware and software on the line to the right of each item. Update this form each time you revise your software or hardware configuration, and use this form as a reference for your current configuration.

## National Instruments Products

- AT-GPIB/TNT (PnP) Board Revision _____
- NI-488.2 Software Revision Number on Distribution Disk(s) _____
- Programming Language Interface Revision _____
- Information from `ni-pnp /v` _____
- Board Settings

| | Base I/O Address | Interrupt Level | DMA Channel |
|---|---|---|---|
| `gpib0` | _____ | _____ | _____ |
| `gpib1` | _____ | _____ | _____ |
| `gpib2` | _____ | _____ | _____ |
| `gpib3` | _____ | _____ | _____ |

## Other Products

- Computer Make and Model _____
- Microprocessor _____
- Clock Frequency _____
- Type of Monitor Card Installed _____
- DOS Version _____
- Application Programming Language (BASICA, Microsoft C, and so on) _____

  _____
- Intel Plug and Play Software Installed (yes or no) _____

- Other Boards in System _____
- Base I/O Address of Other Boards _____
- Interrupt Level of Other Boards _____
- DMA Channels of Other Boards _____

# Documentation Comment Form

National Instruments encourages you to comment on the documentation supplied with our products. This information helps us provide quality products to meet your needs.

Title: **Getting Started with Your AT-GPIB/TNT (PnP) and the NI-488.2™ Software for DOS**

Edition Date: **March 1995**

Part Number: **370884A-01**

Please comment on the completeness, clarity, and organization of the manual.

(continues)

If you find errors in the manual, please record the page numbers and describe the errors.

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# Glossary

| Prefix | Meaning | Value |
|---|---|---|
| m- | milli- | $10^{-3}$ |
| c- | centi- | $10^{-2}$ |
| k- | kilo- | $10^{3}$ |
| M- | mega- | $10^{6}$ |

| | |
|---|---|
| ° | degrees |
| % | percent |
| A | amperes |
| AC | alternating current |
| ANSI | American National Standards Institute |
| ASIC | application-specific integrated circuit |
| base I/O address | lowest of the 32 contiguous I/O addresses used by the AT-GPIB/TNT (PnP) board |
| BIOS | Basic Input/Output System |
| C | Celsius |
| CPU | central processing unit |
| DIP | dual inline package |
| DMA | direct memory access |
| EISA | Extended Industry Standard Architecture |
| EMI | electromagnetic interference |
| FCC | Federal Communications Commission |
| GPIB | General Purpose Interface Bus |
| hex | hexadecimal |
| Hz | hertz |
| I/O | input/output |
| IEEE | Institute of Electrical and Electronic Engineers |
| in. | inches |

| | |
|---|---|
| IRQ | interrupt request |
| ISA | Industry Standard Architecture |
| jumperless | describes configuration of a Plug and Play ISA board in a non-Plug and Play system—such configuration is accomplished entirely from software, but the user must still choose specific system resources for the board |
| KB | kilobytes of memory |
| legacy ISA board | ISA board whose system resources are chosen by changing physical DIP switches or jumpers on the board |
| m | meters |
| MB | megabytes of memory |
| PC | personal computer |
| PnP | plug and play |
| RAM | random-access memory |
| resource | hardware settings used by devices in a computer system, including ISA interrupt level, DMA channel, and base I/O address |
| s | seconds |
| VDC | volts direct current |